

Tectonic evolution of Western Ishtar Terra, Venus. Lucia Marinangeli, Dipartimento di Scienze, Università d'Annunzio, viale Pindaro 42, 65127, Pescara, Italy
e-mail: luciam@sci.unich.it

Introduction

A detailed geological mapping based on Magellan data has been done in Western Ishtar Terra from 300-330W to 65-75N. The area studied comprises three main physiographic provinces, Atropos Tessera, Akna Montes and North-Western Lakshmi Planum. The purposes of this study are 1) to recognize the tectonism of this area and investigate its type, direction, intensity, distribution and age relationships, 2) to define the link between the formation of the Akna mountain belt and the tectonic deformation in adjacent Tessera and Lakshmi Planum.

Atropos Tessera

Atropos Tessera appears to have undergone three phases of tectonic evolution. The first consists of compressional deformations, folds and thrust faults trending NE which is mainly evident in western Atropos Tessera. Since the orientation of these compressional structures is parallel to the tectonic strike of the Akna Montes, they are thought to be formed during the same regional stress field.

A second phase, likely contemporaneous with the first one, is dominated by shear stress deformations which involved most of the Atropos Tessera and developed along NW and ENE planes. The tectonic pattern is expressed as sinuous, tightly closed ridges arranged en-echelon; a similar tectonic pattern has been previously recognised in Itzpapalotl Tessera and interpreted as due to a shear deformation [1,2].

The third phase consists of extension that strongly involved the portion of the Atropos near Akna Montes and decreased in intensity to the West. It consists of long lineaments interpreted to be extensional in origin, trending NE and NW to NS near the Akna Montes.

Akna Montes

The Akna Montes range is distinguished by its high radar brightness and relief; on the basis of the dominant tectonic pattern, it can be divided into two sub-units corresponding to the Eastern and Western

Akna Montes. The Eastern Akna Montes represents the compressional part of the mountain belt, and consists of NE trending folds and thrust faults. The Western Akna Montes is dominated by extensional deformation, consisting of grabens trending NW, NNE and NS.

The Eastern and Western Akna Montes are divided by a long valley flooded by lava which parallels the folds and thrusts of the Akna Montes belt; this element, by itself, is strong evidence for extension which involves the mountain belt.

The extension in this area has been explained by topographic relaxation subsequent to the up-lift of the mountain [3].

North-Western Lakshmi Planum

The most recent history of Western Lakshmi Planum is strongly related to the presence and development of Colette Patera which also is the source of extensive lava flows.

Small relief and plains patches dominated by grabens and fractures, have been found in Lakshmi Planum. Since the orientation of these extensional features does not resemble the tectonic strike of the neighbouring units, they are thought to represent an earlier stage of deformation in North-Western Lakshmi Planum [4].

To the South, plains with wrinkle ridges cover the folds which compose the Akna Montes; the orientation of the wrinkle ridges parallels the tectonic structures of the Akna Montes. This observation suggests the volcanic activity was present in this area during the formation of the compressional features in the mountain belt.

Conclusion

The formation and evolution of Atropos Tessera and Akna Montes appears to be closely related. Their tectonism can be explained by a regional convergence which led to the formation of the Akna Montes and the compressional deformation in the Tessera; the development of shear stress is also consistent with this convergence phase. A subsequent phase is represented by extension and

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interpreted as a consequence of the topographic relaxation of the Akna Montes; this phase also involved the Atropos Tessera.

This scenario is quite similar to the tectonics of terrestrial high plateaus associated with mountain belts (Tibet, Altiplano, Basin and Range) where compression, shear and extension represent the evolution of plateaus over time [5].

In Lakshmi Planum, an earlier extensional phase in the plateau is suggested by small patches of relief and plains which may represent the older underlying bedrock of the plateau deformed by previous tectonic events. The emplacement of volcanic plains during the formation of the compressional structures in Akna Montes is evident in the southern portion of the mountain belt. From the above observation, any model for the formation of Western Ishtar Terra must take into account volcanic activity that took place also during the formation of Akna Montes.

References

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